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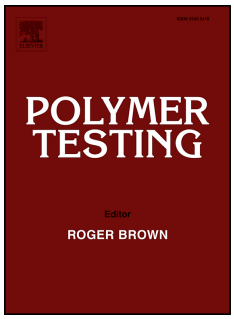

Synergistic effect between hybrid nanoparticles of TiO_2 and Nb_2O_5 in the nanostructured materials based on eva matrix

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SYNERGISTIC EFFECT BETWEEN HYBRID NANOPARTICLES OF TiO_2 AND Nb_2O_5 IN THE NANOSTRUCTURED MATERIALS BASED ON EVA MATRIX

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Abstract

The effect of TiO_2/Nb_2O_5 hybrid nanoparticles added to a poly(ethylene co acetate) (EVA) matrix with 28% vinyl content was evaluated, aiming to shed light on the mechanisms with which oxides, when added as hybrid nanoparticles, can modify specific properties of a polymer matrix. The nanostructured $EVA/TiO_2/Nb_2O_5$ films, containing different proportions of TiO_2/Nb_2O_5 in the range between 0.25 1% referred to total EVA mass, were prepared by the solution casting method. The films were characterized by X-ray diffraction and nuclear magnetic resonance relaxometry, since this technique allows assessing the molecular dynamics and intermolecular interactions of the new materials. According to the relaxometry and X-ray diffraction results, the addition of the two oxides had a positive effect on the EVA matrix through their synergetic action on the physical characteristics of the nanostructured material. The addition of Nb_2O_5 caused a change in the crystallinity and EVA chain mobility. According to the relaxation parameter values and the shape of the domain curves, the materials fabricated in the present work had good polymer-nanoparticle interaction and, consequently, a high level of dispersion and distribution of the oxides was found. The niobium oxide intensified the effect of titanium dioxide, indicating that there was synergy of oxides individual effects for the proportions investigated in this study. This finding is very interesting because the polymer-oxide interface action will influence the characteristics and properties of the new nanostructured materials that can be used in food packaging, because the nanoparticles chosen will give special properties to these materials.

Keywords: Nanocomposites; EVA; TiO_2; Nb_2O_5; relaxometry; NMR